

**UPDATED INFORMATIVE DIGEST  
FOR  
PROPOSED BUILDING STANDARDS  
OF THE  
CALIFORNIA ENERGY COMMISSION**

**REGARDING THE CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS  
CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 1 AND PART 6**

**Summary of Existing Laws**

Public Resources Code (PRC) Sections 25402 and 25402.1 were enacted in 1975 as part of the enabling legislation establishing the Energy Commission and its basic mandates. These sections require the Energy Commission to adopt, implement, and periodically update energy efficiency standards for both residential and nonresidential buildings. Enacted at that same time, Section 25910 directed the Commission to adopt standards for the minimum amount of additional insulation installed [as an alteration] in existing buildings. Senate Bill (SB) 639 (Statutes of 1993) added Section 25402.5 which expressly directed the Commission to consider both new and replacement [as an alteration to an existing building], and both interior and exterior, lighting devices as lighting which is subject to Section 25402. SB 639 also made the express finding that the mandate to consider exterior lighting and replacement lighting is declarative of existing law, clarifying that the Commission's authority related to exterior lighting and to alterations to existing buildings was included in the Legislature's original intent in enacting Section 25402. Assembly Bill (AB) 970 (Statutes of 2000) enacted the requirements in Section 25553 as an urgency statute to respond to California's electricity crisis providing a major impetus to the proposed standards revisions. SB 5X (Statutes of 2001), which also was enacted as an urgency statute in response to the energy crisis to ensure immediate implementation of energy efficiency programs, added subsection (c) to Section 25402.5 to clarify and expand the Commission's authority to adopt standards for outdoor lighting (defined as all electrical lighting not subject to the Commission's current standards).

**Summary of Existing Regulations**

The Building Energy Efficiency Standards were first adopted in 1976 and have been updated periodically since then as directed by statute (the Standards have been updated roughly every three years, more frequently than that in the early years). In 1975 the Department of Housing and Community Development had adopted rudimentary energy conservation standards, under prior legislation, that were a precursor to the first generation of the Building Energy Efficiency Standards. However, the Warren-Alquist Act was passed that year with explicit direction to the Commission to adopt and implement the Building Energy Efficiency Standards. The Commission's statute created completely separate authority and specific direction to the Commission regarding what the Standards are to address, what criteria are to be met in developing standards, and what implementation tools, aids, and technical assistance are to be provided. The Standards contain requirements for newly constructed buildings, additions to existing buildings, alterations to existing buildings and in the case of nonresidential buildings, repairs to existing buildings. The Standards have contained requirements for alterations to existing buildings for both nonresidential buildings and residential buildings since 1976.

The enabling statute stressed the importance of building design and construction flexibility by requiring the Commission to establish performance standards, in the form of an “energy budget” in terms of the energy consumption per square foot of floor space, and to support the performance Standards with compliance software to do the necessary energy calculations. The Commission establishes specific requirements for input, output, and calculational uniformity, enabling private firms to develop compliance software to be approved by the Commission, as long as the software programs meet the specific requirements in the Alternative Calculation Method (ACM) Approval Manuals adopted by regulation in support of the Standards.

Based on field research showing major energy waste due to inadequately sealed duct systems, the Commission launched an effort in partnership with the building industry and the California utilities to establish beginning in 1998 third party field verification to insure that important energy efficiency measures, that are prone to improper installation and construction defects, are diagnostically tested and thoroughly inspected to demonstrate that they are installed effectively. The field verification protocols have been adopted as “eligibility criteria” for qualifying for compliance credit in the performance standards and are contained in the ACM Manuals.

In response to AB 970 (statutes of 2000), the Commission adopted emergency amendments to the standards (AB 970 Phase I) that focused on substantially reducing electricity consumption, particularly peak demand. The current Standards have been limited to buildings that are heated and cooled with some requirements for exterior lighting attached to such buildings; but to date the Standards have not realized the substantial energy savings that could be accomplished through Standards for unconditioned buildings and outdoor lighting.

The Standards have always included schools as one of the building types within the scope of the Standards. The Division of the State Architect (DSA) is the enforcement agency for public school buildings. In 2001 DSA explicitly included in its administrative regulations the expectation that all public school buildings will comply with the Building Energy Efficiency Standards. DSA has been working with support from the Commission to pursue vigorously enforcement of the Standards for schools, including relocatable public school buildings.

The Standards include a basic set of mandatory requirements that apply in all cases. In addition to the mandatory requirements, the performance standards establish energy budgets that vary by climate zone and building type. As an alternative to the performance standards, there are prescriptive requirements that are basically a “checklist” compliance approach that allows little flexibility (the Overall Envelope Approach, a prescriptive option, allows a limited tradeoff method for nonresidential building envelopes). Mandatory requirements that apply to all building types are in Sections 110 - 119. The requirements for nonresidential buildings, high-rise residential buildings and hotels/motels are in Sections 120 to 149 with additional mandatory requirements in Sections 120 to 132; performance standards requirements in Section 141 (supported by the detailed requirements in the Nonresidential ACM Manual); prescriptive requirements in Sections 142 to 146; and requirements for additions, alterations, and repairs to existing buildings in Section 149. The requirements for low-rise residential buildings are in Sections 150 to 152 with additional mandatory requirements in Section 150; performance standards requirements in Sections 151 (b) to 151 (e) (supported by the detailed requirements in the Residential ACM Manual); prescriptive requirements in Section 151 (f); and requirements for additions and alterations to existing buildings in Section 152. The administrative regulations for the Standards are in Part I, Chapter 10.

## **Summary of Effect**

A summary of the changes to current Building Energy Efficiency Standards proposed under this rulemaking are as follows:

### **PART 6**

#### **STANDARDS CHANGES FOR ALL BUILDING TYPES**

***Time Dependent Valuation (TDV)*** (§ 102) The basis of the performance standards calculations will change to time dependent valuation, substantially increasing the importance of measures that reduce peak electricity consumption relative to measures that impact energy use in off-peak periods.

***Performance Requirements for Heat Rejection Equipment*** (§ 112, Table 112-G) Factory assembled cooling towers will be required to be certified by the Cooling Technology Institute to meet the requirements of CTI STD-201. There will be no certification requirements for field erected cooling towers.

***Fenestration Default Values*** (§ 116) The default values for fenestration (windows, skylights, and glazed doors) U-factors and Solar Heat Gain Coefficients will be updated to agree with recently revised National Fenestration Rating Council test procedures.

***Placement of Insulation at the Roof/Ceiling*** (§ 118 (e)) Insulation will be required to be placed directly in contact with a continuous roof or ceiling. Placement on top of a suspended ceiling with removable ceiling panels will be deemed to have no insulative effect except in very limited situations.

***Demising Walls in Nonresidential Buildings*** (§ 118 (f)) The R-value for insulation between framing members of demising walls will be increased from R-11 to R-13.

***Insulation for Heated-Slab Floors*** (§ 118 (g)) Minimum insulation levels, water absorption rates, and insulation protection requirements will be established for insulation used with heated-slab floors.

***Cool Roofs*** (§ 118 (i)) The current requirements for cool roofs to qualify for compliance credit and to meet prescriptive and performance standards requirements will be moved to this location and expanded to allow a means for roofs with very high reflectance and lower emittance to qualify, and requirements for liquid applied roofing products will be revised to be more widely applicable to the range of available coatings.

***Daylighting Controls*** (§ 119 (e), (h) and (i)) Requirements to insure the reliability of Automatic Daylighting Control Devices, Multi-Level Astronomical Time-Switch Controls, and Automatic Multi-Level Daylighting Controls will be added.

## **STANDARDS CHANGES FOR NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL BUILDINGS**

### ***Mandatory Requirements***

**Natural Ventilation** (§121 (b) 1) Current requirements for natural ventilation will be clarified and the depth of spaces allowed to be naturally ventilated in high-rise residential dwelling units and hotel/motel guest rooms is extended to 25 feet.

**Outdoor Air and Demand Control Ventilation** (§ 121 (c) 1, 3, 4, and 5) Demand control ventilation will not be allowed as an alternative to continuous ventilation when operations or processes are present that generate specified pollutants and exhaust ventilation is not provided. With the exception of the above situation, the current requirements for demand control ventilation will be expanded to include specific occupancies with moderate to high occupant densities, which have an outdoor air economizer. Demand control ventilation devices will have new performance requirements. Acceptance requirements will be established to insure demand control ventilation systems are tested before occupancy to determine that they meet Standards requirements. Minimum ventilation rates will be changed for bars, cocktail lounges, and casinos. Acceptance requirements also will be established to insure ventilation systems are tested before occupancy to determine that they meet Standards requirements.

**Space Conditioning Controls Acceptance** (§ 122 (h)) Acceptance requirements also will be established to insure that space conditioning controls are tested before occupancy to determine that they meet Standards requirements.

**Duct Insulation** (§ 124 (a) and (g)) Duct insulation requirements for ducts in unconditioned or indirectly conditioned spaces will be increased to R-8. Flexible ducts having porous inner cores will not be allowed.

**Mechanical System Acceptance** (§ 125 (a), (b), (c), and (d)) Acceptance requirements also will be established to insure mechanical systems are tested before occupancy to determine that they meet Standards requirements, including air distribution system ducts and plenums, economizers, variable air volume systems, and hydronic system controls.

**Indoor Lighting in High-rise Residential Living Quarters and Hotel/Motel Guest Rooms** (§ 130 (b)) Lighting in these spaces will be required to meet the same new requirements for low-rise residential buildings in §150 (k).

**Luminaire Power** (§ 130 (c)) A clarification will be made that the wattage of incandescent or tungsten-halogen luminaires with medium screw base sockets will be the maximum relamping rated wattage of the luminaire shown on a permanent factory-installed label as specified by Underwriters Laboratories.

**Multi-Level Lighting Controls** (§ 131 (b)) Current requirements for lighting controls will be clarified and made more specific.

**Daylit Areas** (§ 131 (c)) Current requirements for lighting controls in daylit areas will be clarified and made more specific.

**Shut-off Controls** (§ 131 (d)) Current requirements for lighting shut-off controls will be clarified and made more specific.

**Lighting Control Acceptance** (§ 131 (f)) Acceptance requirements will be established to insure lighting controls are tested before occupancy to determine that they meet Standards requirements.

**Outdoor Lighting** (§ 132 (a)) The current requirements for high efficacy exterior lighting will be moved to this location and extended to all outdoor lighting with specific exceptions.

**Luminaire Cutoff Requirements** (§ 132 (b)) All outdoor luminaires that use lamps rated greater than 175 watts in hardscape areas including parking lots, building entrances, sales and non-sales canopies, and all outdoor sales areas will be required to be rated as “Cutoff” for light distribution.

**Controls for Outdoor Lighting** (§ 132 (c)) The current requirement for exterior lighting to be controlled by a photoelectric or astronomical time switch will be moved to this location and extended to all outdoor lighting with specific exceptions. The requirement that has been long in effect for indoor lighting for controls capable of “bi-level switching” will be extended to outdoor lighting with specific exceptions.

### **Performance Standards**

**Space-Conditioning Budget** (§ 141 (a) 1) The space conditioning energy budget will be based on Time Dependent Valuation energy, a cool roof for nonresidential buildings with low-slope roofs, a maximum west-wall glazing area, and skylights with daylighting controls where required by the prescriptive standards in addition to other measures required by current energy budget rules.

**Relocatable Public School Buildings** (§ 141 (d)) The energy budget will either be based on the special statewide prescriptive envelope requirements for relocatable public school buildings (relocatables) or the prescriptive envelope requirements for schools that vary by climate zone. Relocatables that will be allowed to be installed anywhere in the state will demonstrate that compliance will be achieved in the most severe climates. Relocatables that will be allowed to be installed in only specific climate zones will demonstrate compliance in each of those climates. Compliance will be demonstrated in all orientations.

### **Prescriptive Standards**

#### **Building Envelope**

**Envelope Component Approach** (§ 143 (a)) This prescriptive checklist approach will be changed so that nonresidential buildings with low-slope roofs will be required to have cool roofs. Insulation will be required to be placed in direct contact with a continuous roof or drywall ceiling. To comply with prescriptive R-values, roofs with metal framing members or a metal deck will be required to install continuous insulation either above the roof deck or between the roof deck and the structural members supporting the roof deck as specified. West-facing window area will be limited to no more than 40 percent of the wall area. The Prescriptive Envelope Criteria in Tables 143-A and 143-B will be updated to base wall U-factors on increased framing percentages, make minor recalculations on other roof/ceiling and floor/soffit U-factors, and match window and skylight U-factors to new National Fenestration Rating Council (NFRC) test procedures. Requirements for relocatable public school buildings will be clarified, including the establishment of special Prescriptive Envelope Criteria (Table 143-C) for relocatables that can be installed in any climate zone in the state, and the requirement that relocatables be labeled to identify that either they can be installed anywhere statewide or they can only be lawfully installed in specific climate zones.

**Overall Envelope Approach** (§ 143 (b)) This prescriptive tradeoff approach for building envelopes will be changed to establish a limit on west-wall area in the Standard Heat Loss Equation, and to provide tradeoffs to account for Cool Roof Rating Council (CRRC) certified reflectance and emittance ratings relative to Standard Heat Gain calculations. The Standard Heat Gain calculations will assume a cool roof for nonresidential low-slope roofs and a nominal default reflectance for nonresidential high-slope roofs, and roofs for high-rise residential buildings and hotel/motels.

**Minimum Skylight Area for Large Enclosed Spaces in Low-Rise Buildings** (§ 143 (c)) Low-rise conditioned or unconditioned enclosed spaces with some exceptions that are greater than 25,000 square feet directly under a roof with ceiling heights greater than 15 feet, and that have a lighting power density for general lighting greater than 0.5 Watt/square feet, will be required to have at least one-half of the floor area daylit by skylights. The skylights will be required to have a glazing material or diffuser that effectively diffuses the daylight, and multi-level daylighting controls will be required.

### **Space Conditioning**

**Outdoor Design Conditions** (§ 144 (b) 4) Outdoor design conditions for equipment sizing will be required to be the 0.5 percent Cooling Dry Bulb and Mean Coincident Wet Bulb temperatures in Joint Appendix II. Cooling design wet bulb temperatures for cooling towers will be the Summer Design Wet Bulb 0.5 percent temperatures.

**Variable Air Volume (VAV) Systems** (§ 144 (c) 2) Variable air volume systems with motors 10 horsepower or larger will be required to have variable speed drives. Static pressure sensors will be required to be placed in a position such that the controller set point is no greater than one-third the total design fan static pressure. The static pressure set point will be required to be reset based on the zone requiring the most pressure.

**Fan Motors of Series Fan-Powered Terminal Units** (§ 144 (c) 3) Fan motors of series fan-powered terminal units will be required to be electronically-commutated or have a minimum motor efficiency of 70 percent.

**Economizer Acceptance** (§ 144 (e) 4) Acceptance requirements will be established to insure that economizers are tested before occupancy to determine that they meet Standards requirements.

**Heat Rejection Systems** (§ 144 (h)) Open cooling towers will be required to be designed so that flow can be turned down to 33 percent of the design flow for the cell. Cooling towers with a combined rated capacity of 900 tons or greater will be required to use propeller fans rather than centrifugal fans.

**Limitation of Air-Cooled Chillers** (§ 144 (i)) Chilled water plants with more than 300 tons capacity will be required to have not more than 100 tons provided by air-cooled chillers.

**Hydronic System Measures** (§ 144 (j)) Chilled and hot water pumping will be required to be designed for variable flow. Chillers and boilers will be required to be designed so that equipment can be isolated to not allow flow through equipment when the equipment is shut off. Chilled and hot water systems with a design capacity greater than 500,000 Btu/h will be required to have temperature reset controls. Water-loop heat pumps will be required to have isolation valves and variable speed drives on the pumps. Variable flow chilled and condenser water pump systems will be required to have variable speed drives and controls.

***Air Distribution System Duct Leakage Sealing*** (§ 144 (k)) Duct systems with more than 25 percent duct surface area in unconditioned or indirectly conditioned spaces will be required to be sealed with leakage not greater than 6 percent of fan flow, confirmed through diagnostic testing and field verification.

***Air Distribution System Duct and Plenum Acceptance*** (§ 144 (l)) Acceptance requirements will be established to insure that duct systems are tested before occupancy to determine that they meet all Standards requirements.

### ***Indoor Lighting***

***Reduction of Wattage Through Controls*** (§ 146 (a) 4) Installing effective controls reduces the duration that lighting equipment is on, thereby reducing energy use. Compliance credit may be taken for installing lighting controls meeting specific criteria through the use of Power Adjustment Factors, which create tradeoffs against the lighting power density allowances in the Standards. To qualify for the Power Adjustment Factor credit in small offices, occupant sensors will be required to have an automatic off function and either a manual on function or bi-level automatic on function with multi-level circuitry and switching. New Power Adjustment Factor credits will be established for the above occupancy sensor combined with daylighting controls in specific spaces and for the above occupancy sensor combined with manual dimming with dimmable electronic ballasts. A new Power Adjustment Factor credit will be established for occupant sensor controlled multi-level switching or dimming that reduces power at least 50 percent when no people are present in hallways of hotels/motels, commercial and industrial storage stack areas, and library stacks. To qualify for the Power Adjustment Factor credit for automatic daylighting controls with windows, stepped switching or stepped dimming/continuous dimming will be required. A Power Adjustment Factor credit for automatic multi-level daylighting controls with skylights will be established with a requirement for the skylight glazing material or diffuser to be highly diffusing as specified. Some previously available Power Adjustment Factor credits will be discontinued.

***Lighting Wattage Excluded*** (§ 146 (a) 5) The list of lighting applications that may be excluded when showing compliance with lighting power density requirements will be clarified to respond to clarification questions that staff has received on the current Standards. Specific lighting applications will be excluded from the indoor lighting power density requirements.

***Complete Building Method*** (§ 146 (b) 1) This method allots maximum lighting power densities for complete buildings. New allotments will be added for financial institutions, hotels, auditoriums and parking garages. The allotments for some existing building types will be reduced to save energy. The use of the power allotment for retail and wholesale stores will be clarified to not allow its use in situations where it is not known at time of permitting if the tenants in a multi-tenant building actually will all be retail and wholesale stores and in situations where the merchandise sales function area makes up less than 70 percent of the building area. The lighting power density allowance for parking garages will not be allowed to be traded off with the lighting power density allowance for the conditioned portion of buildings.

***Area Category Method*** (§ 146 (b) 2) This method allots maximum lighting power densities for specific spaces within a building. New allotments will be established for civic meeting rooms, financial transaction areas, public and commons areas in housing, parking garages, religious worship areas, tenant lease spaces, and transportation functions. The allotments for some existing building types will be reduced to save energy. The tenant lease space allotment will be required for multi-tenant spaces where a tenant is not identified at the time of permitting.

**Tailored Method** (§ 146 (b) 3) This method allots lighting power for specific types of lighting functions, which create special lighting needs that are not present in all buildings or areas within buildings, and which occur infrequently in most buildings. This method allows lighting power allotments to be established for these cases so that the allotment is “tailored” to the specific building. The Tailored Method will be substantially revised to clarify its use, update the allotments for specific lighting functions to require the use of more energy efficient equipment, and constrain its use to situations where special lighting needs truly exist while maintaining flexibility of its use in those situations.

## ***Outdoor Lighting***

**Outdoor Lighting Power** (§ 147) Outdoor lighting power allowances with specific exceptions will be established for the following general outdoor illumination applications: hardscape for automotive vehicular use, hardscape for pedestrian use, pathways, building entrances without canopies, and outdoor sales lots. Tradeoffs among the general illumination applications will be allowed to provide design flexibility. Allowances also will be established for the following specific illumination applications: building facades, outdoor sales frontage, vehicle service station canopies, vehicle service station hardscape, other sales canopies, non-sales canopies, ornamental lighting, drive up windows, guarded facilities, and outdoor dining. The specific illumination allowances will be “use it or lose it” allowances, which can't be traded-off against the allowances for general illumination applications. The lighting power allowances for each illumination application will be established for each of four lighting zones, as specified in Part 1, §10-114. Methods for calculating allowed lighting power levels will be specified. Higher power allowances for hardscape will be provided if specific light levels are required by law through a local ordinance. Higher allotments also will be provided for applications with special security requirements.

## ***Signs***

**Requirements for Signs** (§ 148) Lighting power allowances will be established for internally illuminated and externally illuminated signs for both indoor and outdoor use. Alternatives to the lighting power allowances will be established that allow compliance merely if electronic ballasts are used or if specific light sources are used. The requirements for signs will apply statewide and will not depend on lighting zone.

## ***Additions, Alterations and Repairs***

**Additions** (§ 149 (a)) When the owner chooses to show compliance for an addition by upgrading a component of the existing building to compensate for failing to meet a prescriptive requirement applicable to additions, the upgraded component will be required to meet the requirements for alterations. When ducts will be extended from an existing duct system to serve an addition, the ducts will be allowed to meet the duct sealing requirements for alterations to existing duct systems.

## ***Alterations***

**Prescriptive Approach** (§ 149 (b) 1) Alterations to the building envelope other than for roof replacements, recovering, or recoating, will be required to meet one or the other of the following requirements: i) when there are no changes to fenestration area, the requirements for newly constructed buildings that apply to the altered component, or ii) neither increase the overall heat gain nor increase the overall heat loss of the building envelope. An exception to option i will allow increases of less than 50 square feet of fenestration area or replacements to only a portion of the building's fenestration area to meet the requirements for newly

constructed buildings, except the requirements for solar heat gain coefficient will not be required to be met.

When more than 50 percent of the exterior surface or more than 2,000 square feet of roof (whichever is less) of nonresidential low-slope roofs is replaced, recovered, or recoated, the requirements for cool roofs will apply. A tradeoff option will be established which allows other features of the building envelope to be improved to compensate for failure to meet the cool roof requirements. An exception will be established for roof recoverings allowed by the California Building Code when both the existing roof and the new roof have a rock or gravel surface, when there is no removal of existing layers of roof coverings, when there is no recoating with a liquid applied coating and when there is no installation of a recover board, rigid insulation or other rigid, smooth substrate.

When new or replacement ducts are installed to serve an existing building where the ducts are located in unconditioned or indirectly conditioned space as specified by § 144 (k), the duct system will be required to meet the mandatory requirements in § 124 and be sealed, tested and field verified. Ducts that form entirely new duct systems will be sealed to meet the prescriptive requirements for newly constructed buildings. New ducts that extend an existing duct system will have two options: i) the measured duct leakage for the combined new and existing duct system will be less than 15 percent of fan flow, or ii) the duct leakage prior to sealing will be reduced by more than 60 percent and a visual inspection will be required to show that all accessible leaks have been sealed. It is possible that neither of the two options for extensions of existing duct systems can be achieved. If that is the case, compliance will require that a certified Home Energy Rating System (HERS) rater verifies that all accessible leaks have been sealed. Duct sealing will not be required when an existing duct system that is extended is constructed, insulated, or sealed with asbestos.

When a space conditioning system is altered by the installation or replacement of space conditioning equipment, including replacement of an air handler, cooling or heating coil, or furnace heat exchanger, the existing duct system that is connected to that new or replaced space conditioning equipment will be required to be sealed, tested, and verified to the same requirements of new ducts that extend an existing duct system. Duct sealing will not be required when the existing duct system is altered to no longer be within the scope of § 144 (k); when the existing duct system is documented to have been previously sealed, tested and field verified; or when the existing duct system is constructed, insulated or sealed with asbestos.

Alterations to existing outdoor lighting systems that increase the connected load or replace more than 50 percent of the luminaries will be required to meet the lighting power allowances in § 147.

New internally and externally illuminated signs installed in conjunction with alterations will be required to meet the requirements for signs in § 148, as well as alterations to signs that increase the connected lighting load or replace and rewire more than 50 percent of the ballasts in existing signs or relocate the sign to a different location.

**Performance Approach** (§ 149 (b) 2) The altered building will be required to be improved so that the building uses no more energy than an energy budget that is based on: i) compliance with the cool roof requirements for roof replacements, ii) no other changes to the existing building envelope, and iii) compliance with the prescriptive requirements for mechanical and lighting system alterations.

## **STANDARDS CHANGES FOR LOW-RISE RESIDENTIAL BUILDINGS**

### ***Mandatory Requirements***

***Air Retarding Wrap*** (§ 150 (f)) The requirements for an infiltration barrier, which no longer apply, will be replaced by requirements for air retarding wraps, as specified in the Residential ACM Manual.

***Design Conditions*** (§ 150 (h) 2) Outdoor design conditions for equipment sizing will be required to be the 1.0 Percent Cooling Dry Bulb and Mean Coincident Wet Bulb temperatures in Joint Appendix II.

***Water Piping and Cooling System Line Insulation Thickness and Conductivity*** (§ 150 (j) 2) The method for specifying water piping and cooling system line insulation requirements that has previously been used for nonresidential and high-rise residential buildings, will be applied to low-rise residential buildings while maintaining the overall stringency of the existing low-rise residential requirements. This change will add clarity and flexibility for calculating insulation thickness for the complete range of insulation materials commonly in use. Insulation requirements will be clarified to apply to all cooling system refrigerant suction, chilled water and brine lines. To meet pipe insulation requirements in § 151 (f) 8 D, or to gain credit for pipe insulation to comply with the performance standards, exceptions are established to not require pipe insulation on piping that penetrates framing members, piping installed in walls that are insulated in conformance to the Insulation Installation Quality compliance option, and in attics with a minimum of four inches of attic insulation on top of the piping.

***Residential Lighting*** (§ 150 (k)) The requirements for residential lighting will be substantially revised to increase clarity and specificity, require high efficacy lighting equipment or energy savings controls for permanently installed luminaires in all lighting functions, as well as require recessed luminaires in insulated ceilings to be airtight. At least 50 percent of the lighting wattage in kitchens will be required to be high efficacy. Lighting in bathrooms, garages, laundry rooms, and utility rooms will be required to be high efficacy or controlled by a "manual on" occupant sensor. Lighting in other indoor spaces will be required to be high efficacy or be controlled by a dimmer switch. Outdoor lighting permanently mounted to a building will be required to be high efficacy or be controlled by a motion sensor with an integral photosensor. Lighting in parking lots and parking garages for eight or more vehicles will be required to meet all applicable mandatory and prescriptive requirements in other sections of the Standards that apply to such lighting. Lighting installed in the common areas of low-rise residential buildings with four or more dwelling units will be required to be high efficacy or be controlled by an occupant sensor.

### ***Performance Standards***

***Water Heating Budgets*** (§ 151 (b) 1) The water heating budget for systems serving multiple dwelling units will be based on a central recirculating water heating system with gas water heaters and timer controls. For systems serving individual dwelling units, a single storage type gas water heater meeting the prescriptive and mandatory standards will be the basis of the energy budget. The energy budget for systems serving individual dwelling units will also be met by installation of an instantaneous gas water heater.

***Space-conditioning Budgets*** (§ 151 (b) 2) The space conditioning budgets will be changed to be based on the revised prescriptive requirements in Section 151 (f) using an approved calculation method meeting the requirements of the Residential ACM Approval Manual.

## ***Prescriptive Standards***

**Fenestration Glazing** (§ 151 (f) 3) Area-weighted average U-factors will be allowed to be used to comply with U-factor requirements. The U-factor requirements in Package D will be updated to match the new NFRC test procedures. The maximum fenestration area requirements in Package D will be revised to be 20 percent in all climate zones. In specific climate zones with substantial summer cooling energy use, the west-facing fenestration area in Package D will be limited to 5 percent of the conditioned floor area.

**Shading** (§ 151 (f) 4) Area weighted average Solar Heat Gain Coefficients (SHGCs) will be allowed to be used to comply with SHGC requirements for fenestration products other than skylights. Skylights will continue to be required to comply with SHGC requirements individually.

**Space Heating and Space Cooling** (§ 151 (f) 7) Air conditioners and heat pumps will be required to meet new federal appliance standards as specified in the Appliance Efficiency Regulations.

**Water-Heating Systems** (§ 151 (f) 8) Water heaters will be required to meet new federal appliance standards as specified in the Appliance Efficiency Regulations. For systems serving individual dwelling units, either a single gas storage type water heater, 50 gallons or smaller, with no recirculation pumps and meeting the mandatory insulation requirements for storage tanks and hot water pipes to the kitchen, or instantaneous gas water heaters will be required. For systems serving multiple dwelling units, a central recirculating water heating system with gas water heaters with timer controls will be required. Hot water pipes from the water heater to the kitchen fixtures that are  $\frac{3}{4}$  inches or greater in diameter will be required to be insulated.

**Space Conditioning Ducts** (§ 151 (f) 10) Duct insulation requirements for Package D will be R4.2 in climate zones 6, 7, and 8; R6 in climate zones 1-5, and 9-13; and R8 in climate zones 14, 15 and 16. Duct insulation requirements for Package C will be R8 statewide.

## ***Additions and Alterations***

### ***Additions***

**Prescriptive Approach** (§ 152 (a) 1) The fenestration in additions up to 100 square feet will be required to meet the U-factor requirements in Package D.

**Performance Approach** (§ 152 (a) 2) When the builder chooses to show compliance for an addition by upgrading a component of the existing building to compensate for failing to meet a prescriptive requirement applicable to additions, the upgraded component will be required to meet the requirements for alterations. When ducts will be extended from an existing duct system to serve an addition, the ducts will be allowed to meet the duct sealing requirements for alterations to existing duct systems.

### ***Alterations***

**Prescriptive Approach** (§ 152 (b) 1) Alterations that add fenestration area will be required to meet the U-factor, fenestration area, and SHGC requirements of Package D with the exception that increases of fenestration area up to 50 square feet that meet the U-factor and SHGC requirements will be allowed.

Replacement fenestration, where all the glazing in an existing fenestration opening is replaced with a new manufactured fenestration product, will be required to meet the U-factor and SHGC requirements of Package D. Glass replaced in an existing sash and frame and replacement of a single sash in a multi-sash fenestration product are considered repairs, which are not required to comply.

When more than 40 feet of new or replacement space conditioning ducts are installed to serve an existing building, the new ducts will be required to meet the mandatory requirements in § 150 (m) and the duct insulation requirements in Package D, and in climate zones 2 and 9-16 the combined new and existing duct system will be required to be sealed, tested, and field verified. Ducts that form entirely new duct systems will be sealed to meet the prescriptive requirements for newly constructed buildings. New ducts that extend an existing duct system will have three options: i) the measured duct leakage for the combined new and existing duct system will be less than 15 percent of fan flow; ii) the duct leakage to outside will be less than 10 percent of fan flow; or iii) the duct leakage prior to sealing will be reduced by more than 60 percent and a visual inspection and smoke test will be required to show that all accessible leaks have been sealed. It is possible that none of the three options for extensions of existing duct systems can be achieved. If that is the case, compliance will require that a certified HERS rater verifies through observation and a smoke test that all accessible leaks have been sealed. Duct sealing will not be required when an existing duct system that is extended is constructed, insulated, or sealed with asbestos.

When a space conditioning system is altered by the installation or replacement of space conditioning equipment, including replacement of an air handler, cooling or heating coil, or furnace heat exchanger, the existing duct system that is connected to that new or replaced space conditioning equipment will be required to be sealed, tested and verified to the same requirements of new ducts that extend an existing duct system. Duct sealing will not be required when the existing duct system is documented to have been previously been sealed, tested and field verified; when the existing duct system is less than 40 linear feet in unconditioned spaces or when the existing duct system is constructed, insulated or sealed with asbestos.

**Performance Approach** (§ 152 (b) 2) The altered building will be required to be improved so that the building uses no more energy than an energy budget based on an unchanged existing building except that those altered components that do not meet the prescriptive alteration requirements are upgraded to meet those requirements. When an altered component does meet the prescriptive alteration requirements, the energy budget will be based on the existing building without that altered component.

## **PART 1, CHAPTER 10 - ADMINISTRATIVE REGULATIONS CHANGES**

**Application for a Building Permit** (§ 10-103 (a) 2 B) Plans and specifications submitted with an application for a building permit for nonresidential buildings, high-rise residential buildings, and hotels and motels will be required to include acceptance requirements where required in Part 6. Within 90 days after the enforcement agency issues a final permit, record drawings will be required to be provided to the building owner.

**Certificate of Acceptance** (§ 10-103 (b) A Certificate of Acceptance will be required to be filed with and approved by the enforcement agency prior to receiving a final occupancy permit. The Certificate of Acceptance will indicate that the applicant has demonstrated acceptance requirements in the plans and specifications, that current requirements for installation certificates are met, and that currently required operating and maintenance information (as well as the Certificate of Acceptance) were provided to the building owner.

**Enforcement Agency Requirements** (§ 10-103 (e) 2) The enforcement agency inspection requirements will be revised for buildings, which have used a compliance option that requires field verification and diagnostic testing, to require the building department to not approve the building until the building department has received a Certificate of Field Verification and Diagnostic Testing that has been signed and dated by the Home Energy Rating System (HERS) rater.

**Certification and Labeling of Fenestration Product U-factors, Solar Heat Gain Coefficients and Air Leakage** (§ 10-111) This section will be substantially rewritten for clarity.

**Certification and Labeling of Roofing Product Reflectance and Emittance** (§ 10-112 (a)) Labeling requirements for roofing products will be revised to match those required by the Cool Roof Rating Council (CRRC-1) and the marking of roofing packaging for liquid-applied coatings will be reduced to a statement that the product meets the requirements of Part 6, § 118 (i) 3.

**Determination of Outdoor Lighting Zones and Administrative Rules for Use** (§ 10-114) Lighting zones which vary by ambient illumination levels will be established, and statewide default locations will be specified. Procedures will be established for local jurisdictions officially to adopt changes to the statewide default locations to meet local outdoor lighting needs.

## **OTHER CHANGES TO THE STANDARDS AND ADMINISTRATIVE REGULATIONS**

Changes will be made throughout the Standards (including extensive changes to Part 6, Subchapter 1 and Appendix 1-A) to update the Standards to incorporate requirements for unconditioned buildings, outdoor lighting, and signs; to update information related to referenced standards, test procedures, and other documents; to revise definitions for clarity and consistency with other revisions to the Standards; and to improve the clarity of the Standards.

## **CHANGES TO THE ALTERNATIVE CALCULATION METHOD APPROVAL MANUALS**

The Alternative Calculation Method Approval (ACM) Manuals are adopted by reference in Part 1 to support the Standards in Part 6. The ACM Manuals contain detailed requirements that developers of computer software must meet for the Commission to approve their software for showing compliance with the Standards. They also contain detailed information regarding compliance options, including specific calculation algorithms that have been approved for assessing the compliance credit or penalty due to installation of the compliance option and specific eligibility criteria (minimum performance requirements or required installation methods) that must be met for a measure to qualify for compliance credit.

Many of the compliance options require diagnostic testing and field verification by a certified HERS rater. The ACM Manuals contain explicit protocols for how the diagnostic testing must be conducted both by installers and HERS raters and procedures for the field verification. The ACM Manuals also provide detailed building material characteristics data, weather data, and other information necessary for completing calculations for showing compliance with the Standards. The ACM Manuals will be extensively revised to improve their clarity and organization, incorporate new compliance options including new diagnostic testing protocols, improve field verification procedures, and improve the data needed for Standards calculations.

## ***Residential Alternative Calculation Methods Approval Manual***

Approved compliance software will be required to produce a revised Certificate of Compliance form (CF-1R) that combines the information that previously was provided on two forms (CF-1R and C-2R), thus reducing and simplifying compliance documentation. Procedures for implementing Time Dependent Valuation will be required. A number of modeling algorithm and assumptions changes will be made, including new modeling rules for water heating pipe distribution systems, water heating recirculation systems in multi-family buildings, hourly duct efficiency, slab edge losses, and thermostat setpoints and schedules.

New compliance rules will be implemented for treatment of glazing area, basing energy budgets for multi-family buildings using a central water heating system on a central, recirculating water heating system, and basing wall U-factors on a 25 percent framing factor. All U-factors for building envelope assemblies will be required to be determined using extensive look-up tables in Joint Appendix IV. U-factors for unique assemblies that diverge from the table values will be required to be approved by the Commission.

Calculation procedures for solar water heating systems will be substantially improved for accuracy and to better coordinate with the Solar Rating and Certification Corporation (SRCC) ratings. The modeling and compliance procedures for duct efficiency improvements will be substantially revised to integrate the implications of supply duct location, surface area, and R-value, as well as to facilitate compliance efforts to improve these duct characteristics, including the provision of a new compliance option for ducts buried in blown ceiling insulation. The modeling and compliance procedures for air conditioner refrigerant charge and air flow will be revised to match recent research findings on the energy consequences of these measures and to update air flow diagnostic testing protocols.

New compliance options will be established for gas absorption cooling, reduced air handler fan watt draw, high EER air conditioners, properly sized air conditioners, and high quality insulation installation. New calculation methods will be implemented for existing plus addition plus alteration compliance. New procedures will be required and new accuracy tests will be established for computer compliance software to match changes in the Standards, and modeling algorithms, assumptions, and rules.

Procedures for field verification by certified HERS raters will be clarified and improved, including a new process whereby Third Party Quality Control Programs can serve the function of HERS raters for field verification purposes; and new procedures for field verification for additions and alterations. In addition the Residential ACM Manual will be substantially re-written and reorganized for clarity and accuracy, and appendices will be substantially revised and supplemented to improve existing protocols and add new ones.

## ***Nonresidential Alternative Calculation Methods Approval Manual***

Procedures for implementing Time Dependent Valuation will be required. All U-factors for building envelope assemblies will be required to be determined using extensive look-up tables in Joint Appendix IV. U-factors for unique assemblies that diverge from the table values will be required to be approved by the Commission.

New compliance rules related to basing the energy budget on new prescriptive requirements will be implemented. A new occupancy category with associated schedules will be added for retail buildings. New algorithms will be added for gas engine driven chillers and heat pumps, and underfloor air distribution systems.

Modeling algorithms and compliance procedures for improvements in duct efficiency, for ducts located in unconditioned or indirectly conditioned space, will be extensively revised. A new appendix will be added to address modeling, diagnostic testing, and field verification requirements for duct sealing where required by the Standards in newly constructed buildings, additions, and alterations.

Procedures for field verification by certified HERS raters will be clarified and improved, including a new process whereby Third Party Quality Control Programs can serve the function of HERS raters for field verification purposes; and new procedures for field verification for additions and alterations.

A new appendix will be added that covers the requirements for compliance modeling for relocatable public school buildings. Another new appendix will be added that covers the specific protocols that must be used to complete acceptance testing for outdoor air, packaged space conditioning systems, air distribution systems, lighting control systems, economizer controls, demand control ventilation systems, variable frequency drive systems, and hydronic systems controls.

In addition the Nonresidential ACM Manual will be substantially re-written and reorganized to improve clarity and accuracy.

### ***Joint Appendices***

New Joint Appendices will be provided that consolidate the information and data needed for understanding and complying with the Standards and developing approved calculation methods. These new Joint Appendices will be a consolidation and updating of information previously supplied in ACM Manual appendices and in the Commission's Nonresidential Manual. The Joint Appendices also will include new information and data needed for compliance with the new Standards.

Joint Appendix I will provide a comprehensive glossary of the terms used in the Standards and compliance documents, updating all definitions to be consistent with Standards changes and to improve clarity and accuracy. Joint Appendix II will provide consolidated information about California climate zones and outdoor design temperature data for California locations that will be required for sizing space conditioning systems.

Joint Appendix III will provide information about the Time Dependent Valuation factors that will be required for performance standards compliance. Joint Appendix IV will provide U-factor, C-factor, and thermal mass data that will be required for modeling building envelope assemblies and for showing compliance with prescriptive envelope requirements.

### **Comparable Federal Statutes or Regulations**

There are no federal building energy efficiency standards applicable to nonfederal buildings. The California Building Energy Efficiency Standards do, however, reference federal energy efficiency standards for particular appliances. Federal law requires that state building energy codes be based on the efficiency requirements of the federal appliance efficiency standards. New efficiency standards for water heaters and air conditioners, adopted by reference in the California Building Energy Efficiency Standards, were adopted by the United States Department of Energy as documented in 10 CFR Part 430, Volume 66, Number 11, January 17, 2001, and 10 CFR Part 430, Volume 67, Number 100, May 23, 2002, respectively.

### **Small Business Affect**

The Standards will have no adverse impact on small business. On the contrary the Standards will reduce the energy bills of businesses that own and occupy buildings subject to the Standards by substantially more than the costs to install required measures, thereby increasing the profitability of these businesses. Also, the investment in cost effective energy efficiency measures will raise the property value of the buildings, providing a substantial return on investment at the point of resale. Businesses that provide energy efficiency products and services associated with the Standards requirements (many of them small businesses) will have expanded business opportunities. During the course of the proceeding the Energy Commission encouraged stakeholders to identify aspects of the Standards that might cause difficulties, and worked with commenters to identify and incorporate alternatives that could lessen any perceived difficulties. The following trade organizations and small businesses thanked the Commission for listening to issues they raised and revising the Standards to address their concerns: California Building Industry Association, California Association of Building Energy Consultants, National Electrical Manufacturers Association, North American Insulation Manufacturers Association, California Billboard Association, California Sign Association, Gardner Industries, Signtronix, Young Electric Sign Company, and APP-TECH, Inc.

### **Plain English Policy Statement**

The State of California is in a critical situation related to energy. Within the last four years California has experienced rolling blackouts, sharply rising electricity and natural gas costs, major utilities that are among the largest businesses in California facing bankruptcy, and in some cases health and life safety emergencies due to energy disruptions or unaffordable energy bills. Low-income people have been particularly vulnerable. The energy crisis has been a major contributing factor to the economic downturn in the state and the fiscal crisis facing State government.

Recognizing the importance of reducing energy consumption in buildings, the Legislature and the Governor enacted AB 970 (Statutes of 2000) as urgency legislation. AB 970 directed the Energy Commission to “adopt and implement updated and cost-effective standards pursuant to Section 25402 to ensure the maximum feasible reductions in wasteful, uneconomic, inefficient or unnecessary consumption of electricity...” AB 970 directed updated building standards to be adopted and implemented within 120 days or the earliest feasible date thereafter. The Commission completed the adoption of emergency updates to the Standards within the legislative deadline, but substantial opportunities to further reduce energy consumption could not be accomplished in that timeframe. So, immediately after adopting the AB 970 emergency standards, the Commission initiated a project, “AB 970 Phase II,” to pursue in the next triennial update of the Standards the additional measures expected to be adopted by AB 970 “at the earliest feasible date.”

In addition, the Legislature and Governor recognized the critical need to adopt energy efficiency building standards for outdoor lighting by enacting SB 5X (Statutes of 2001) as urgency legislation. SB 5X clarified and expanded the Commission’s authority to adopt building standards for all types of lighting. Prior to SB 5X the Commission’s Standards addressed only lighting inside conditioned buildings or exterior lighting attached to or served by electricity supplied from conditioned buildings. SB 5X gave the Commission explicit direction to adopt building standards for all electrical lighting not subject to the Commission’s current Standards. This includes lighting in unconditioned buildings and outdoor lighting. In the winter prior to the passage of this bill, rolling blackouts had occurred at night when outdoor lighting was in peak use. The importance of

saving energy in outdoor lighting had previously been signaled by the Governor's Order No. D-19-01, which required businesses to reduce outdoor lighting by 50 percent after business hours.

The Standards proceeding also is pursuing major objectives of the Commission, including the adaptation of the Standards to emphasize energy efficiency measures that save energy at peak periods and seasons, encouragement of improvements in the quality of installation of energy efficiency measures, and adoption of requirements based on the findings of recent publicly funded building science research. The proceeding also represents a collaboration with the California utilities to coordinate upgraded building standards with publicly funded market incentive programs, regarding technologies that have been demonstrated through those programs to be appropriate for incorporation into Standards.